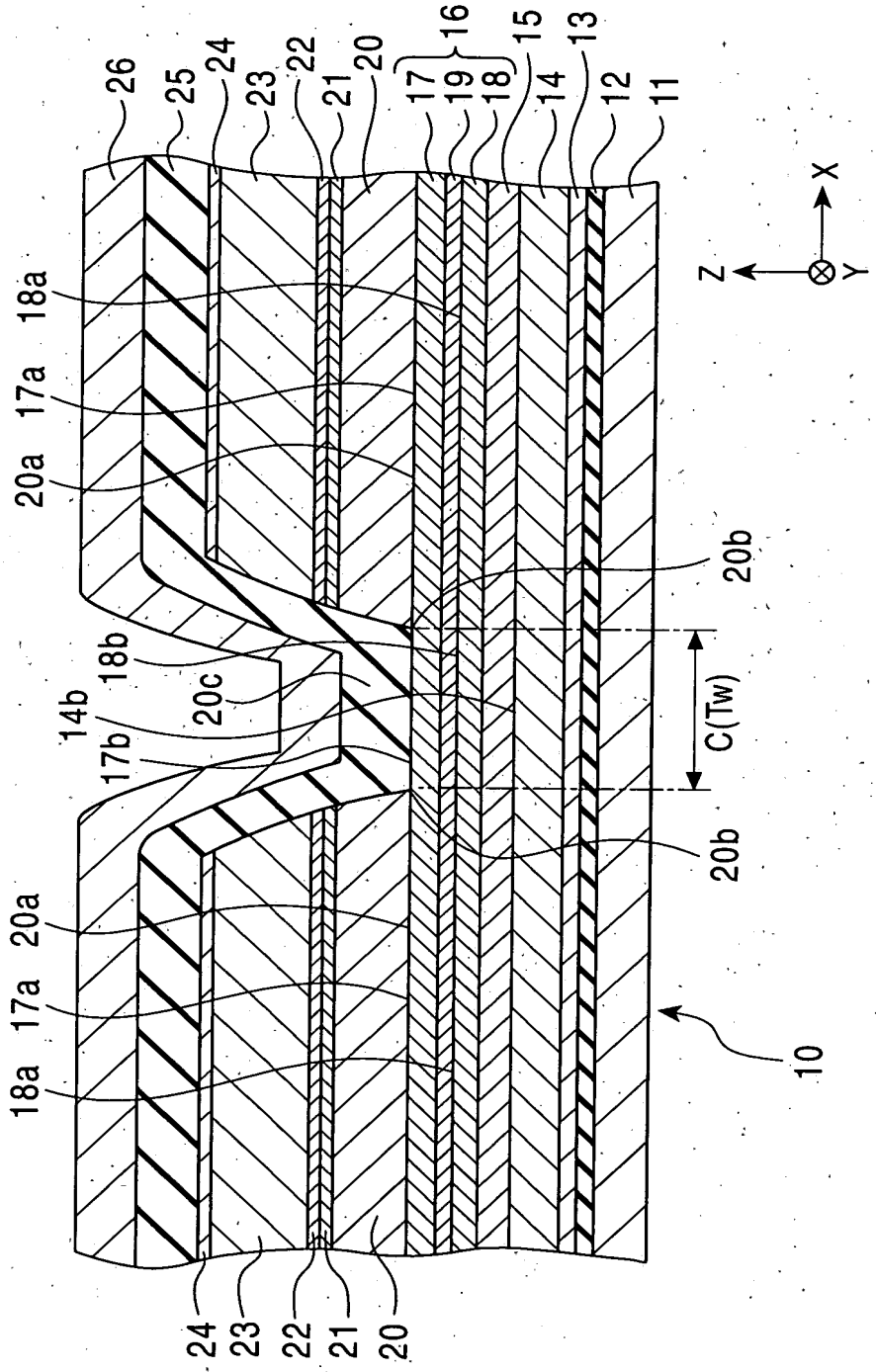
FIG. 1


26
25
24
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22
21
20
17
19
16
18
15
14
13
12
11
18a
17a
20a
20b
18b
20c
14b
17b
C(Tw)
20b
20a
17a
18a
10
24
23
22
21
20
X
Z
Y

FIG. 2

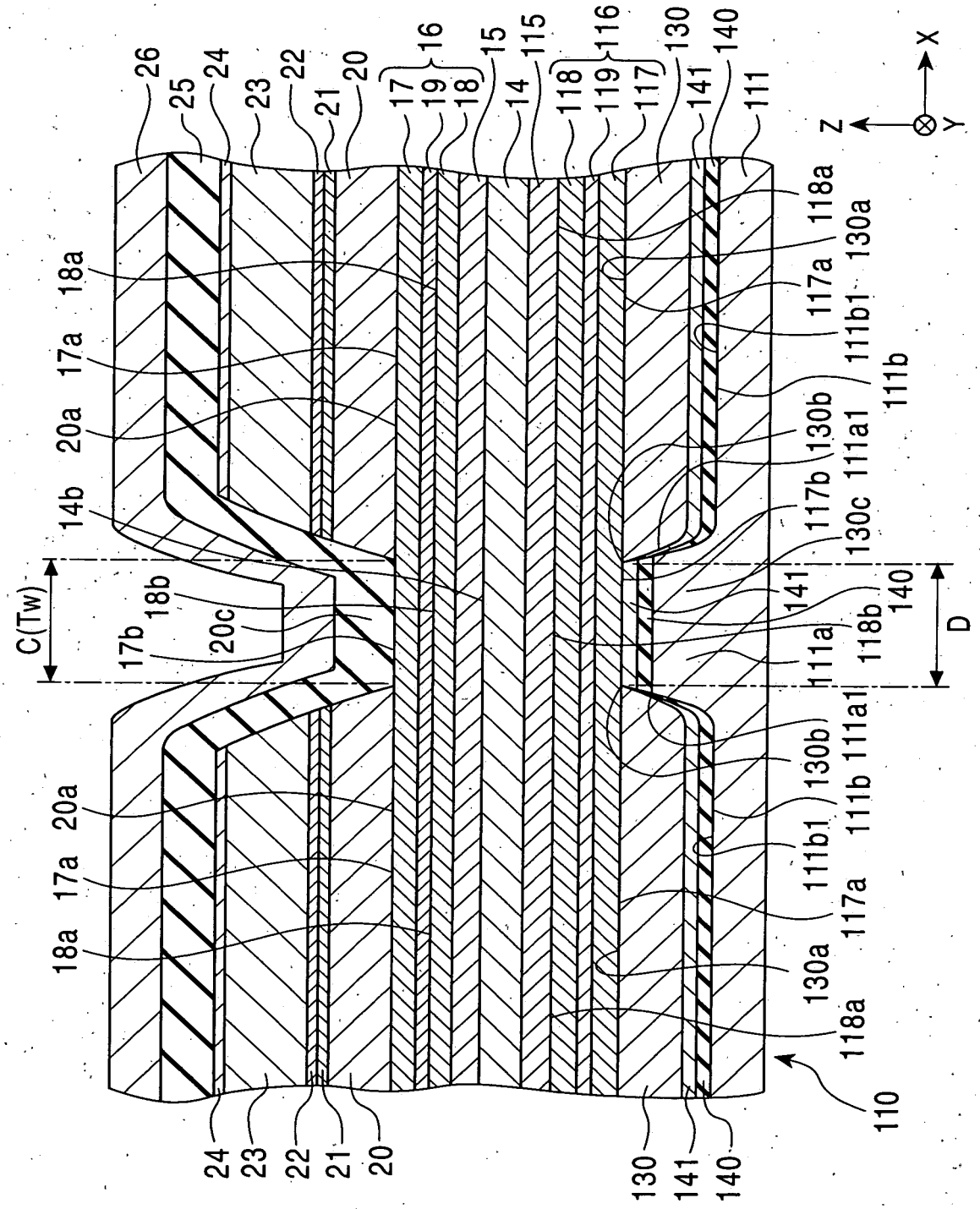
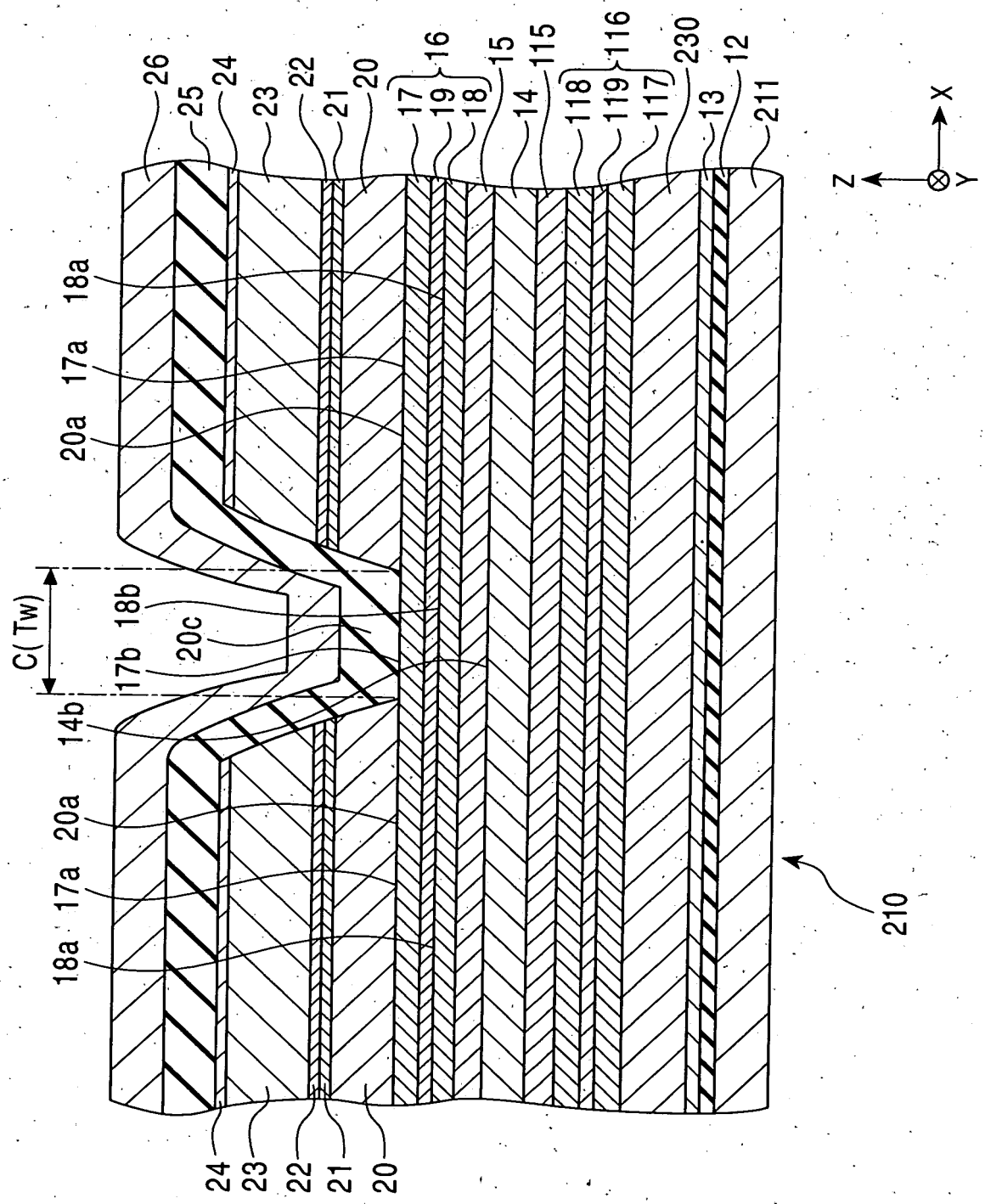

26
25
24
23
22
21
20
17
19
18
16
15
14
115
118
119
116
117
130
141
140
111
Z
X
Y
18a
17a
20a
14b
C(Tw)
17b
18b
20c
118a
130a
117a
111b1
111b
130b
111a1
130c
141
140
D
111a
118b
110

FIG. 3


26
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24
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22
21
20
17
19
16
18
15
14
115
118
116
119
117
230
13
12
211
X
Z
Y
18a
17a
20a
C(Tw)
18b
17b
20c
14b
20a
17a
18a
210
24
23
22
21
20

FIG. 4

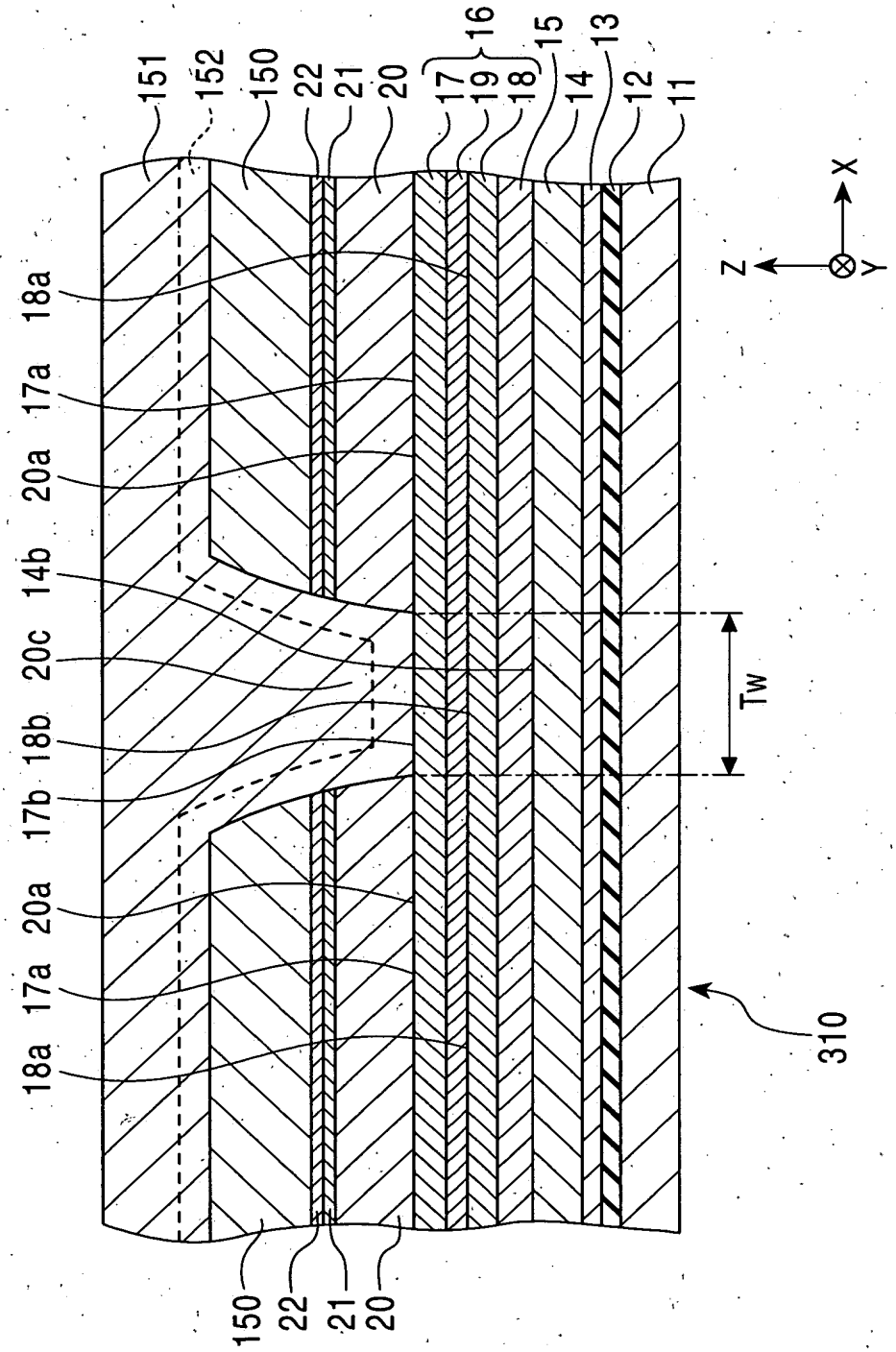

151
152
150
22
21
20
17
19
16
18
15
14
13
12
11
X
Z
Y
18a
17a
20a
14b
20c
18b
17b
20a
17a
18a
Tw
310
150
22
21
20

FIG. 5

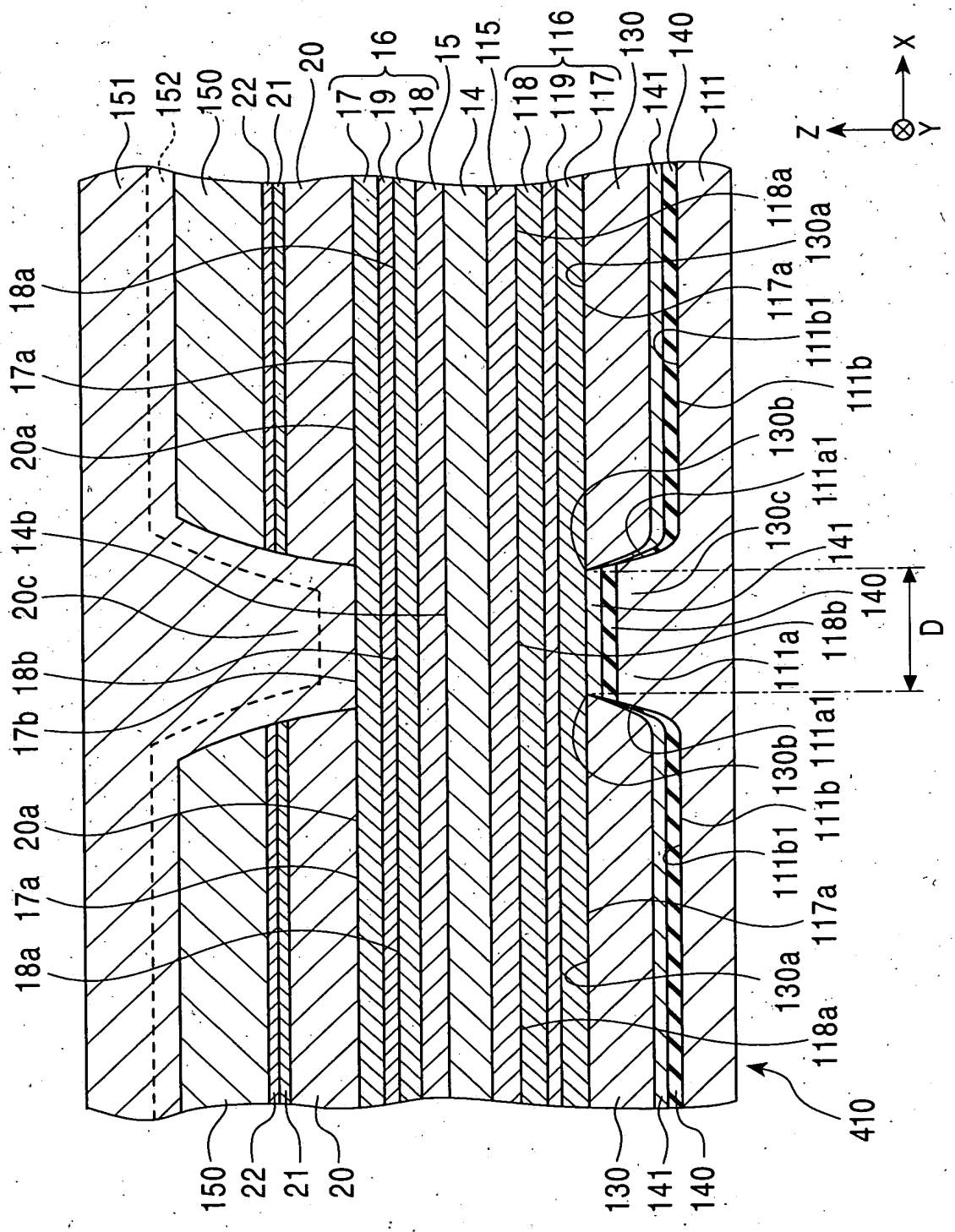

151
152
150
22
21
20
17
19
16
18
15
14
115
118
116
119
117
130
141
140
111
X
Z
Y
18a
17a
20a
14b
20c
18b
17b
20a
17a
18a
118a
130a
117a
111b1
111b
130b
111a1
130c
141
140
D
111a
118b
130b
111a1
111b1
117a
130a
118a
410
150
22
21
20
130
141
140

FIG. 6

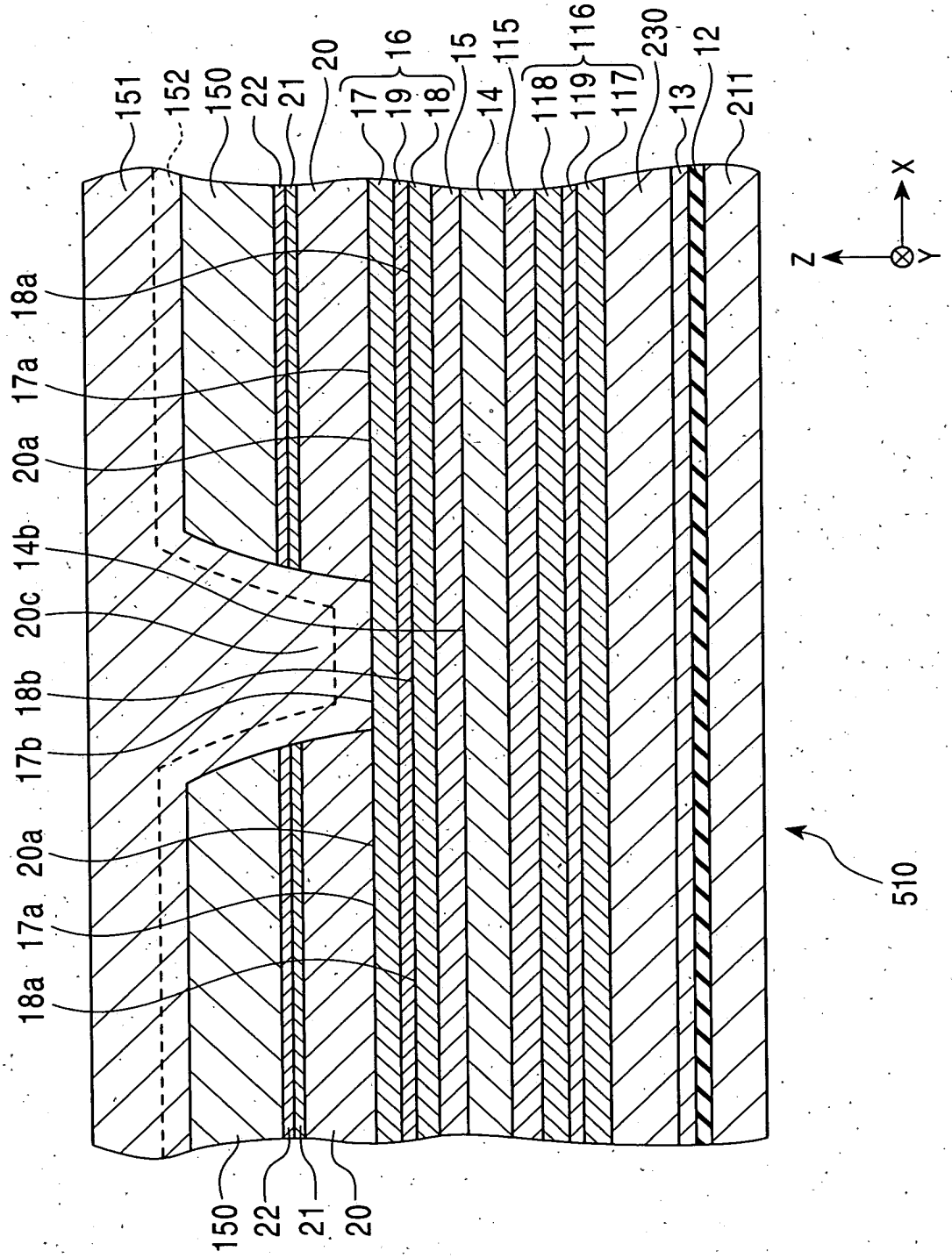
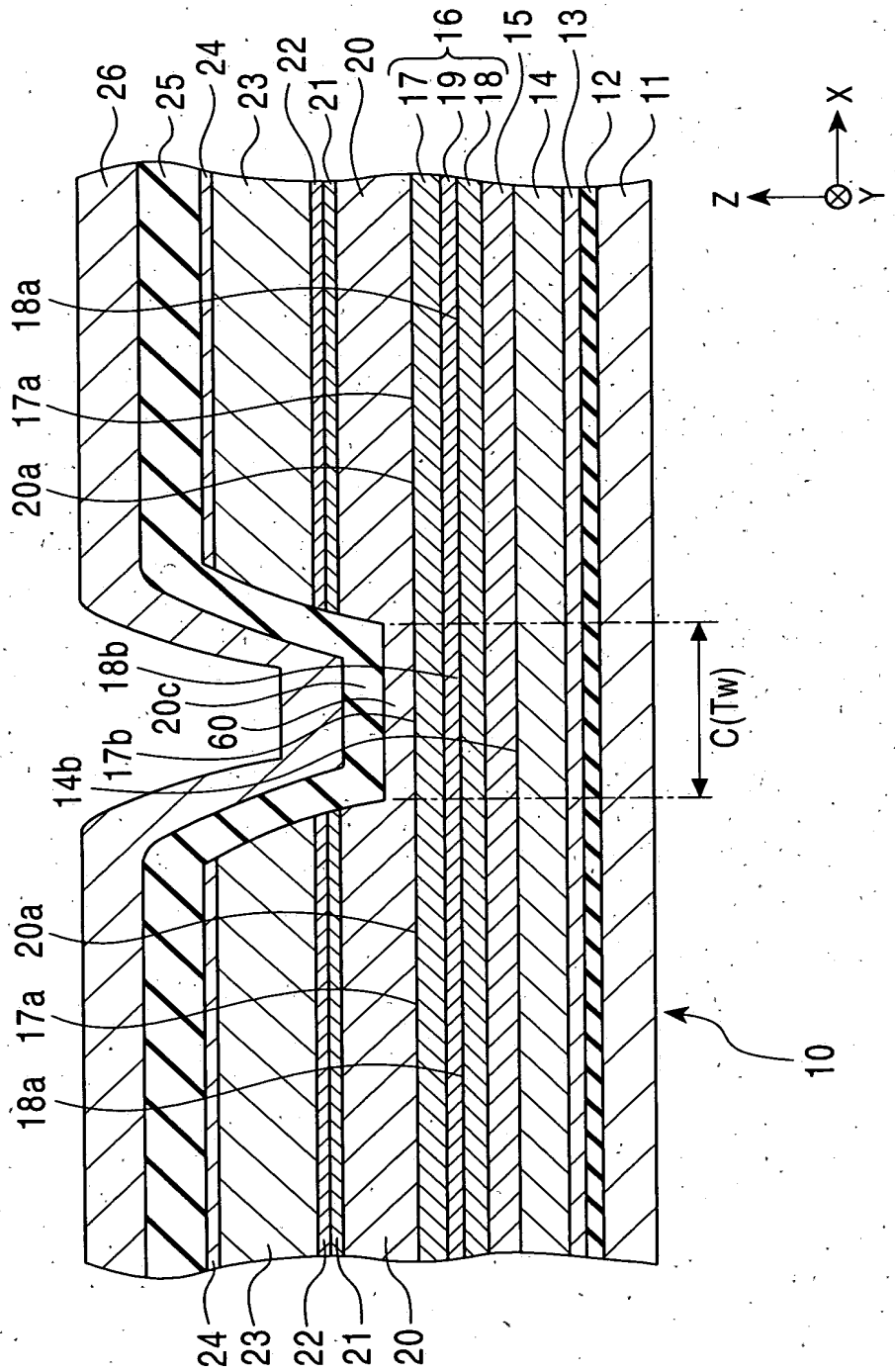

151
152
150
22
21
20
17
19
16
18
15
14
115
118
116
119
117
230
13
12
211
X
Z
Y
18a
17a
20a
14b
20c
18b
17b
20a
17a
18a
510
150
22
21
20

FIG. 7


26
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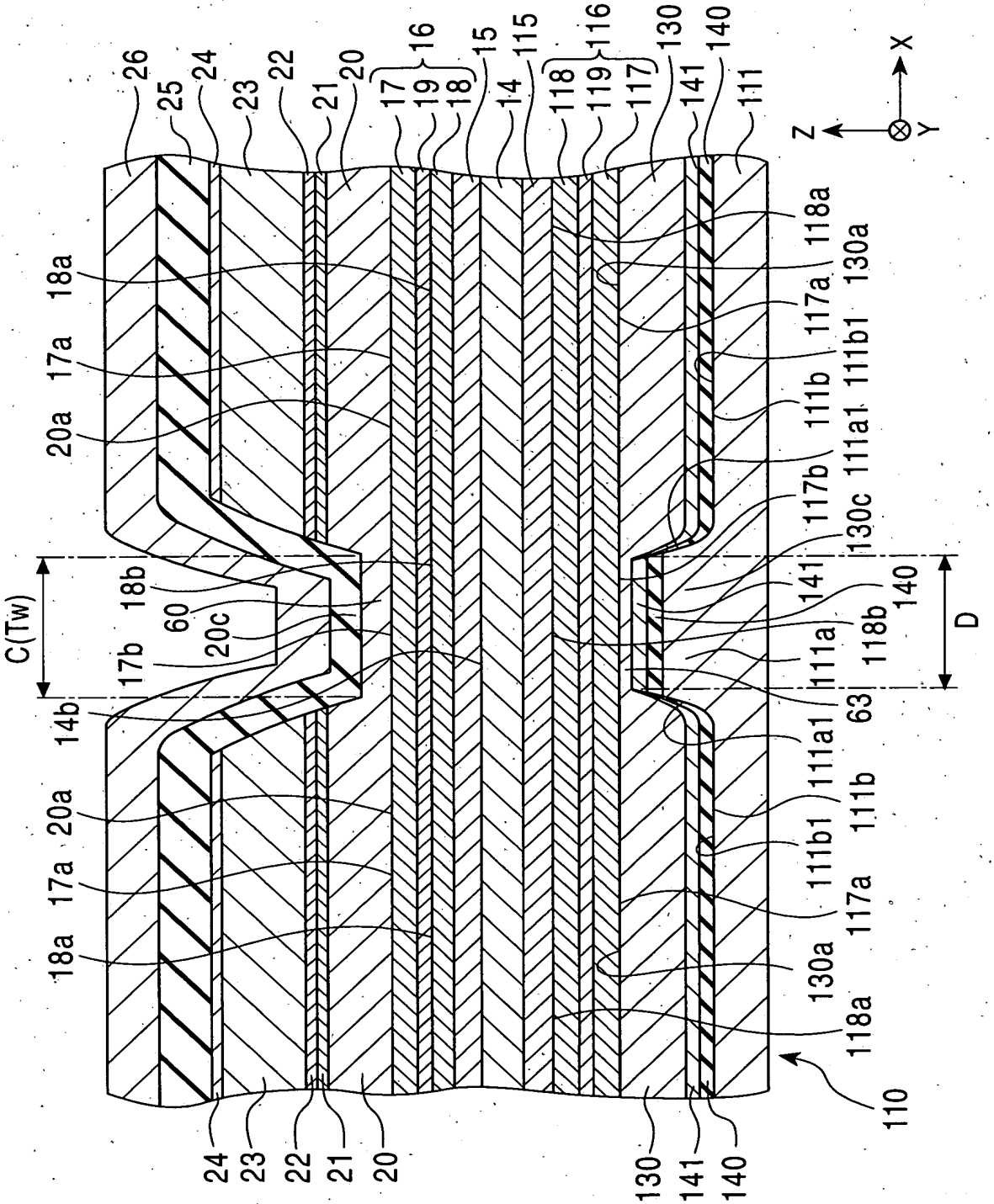
21
20
17
19
18
16
15
14
13
12
11
X
Z
Y
18a
17a
20a
18b
20c
60
17b
14b
C(Tw)
10

FIG. 8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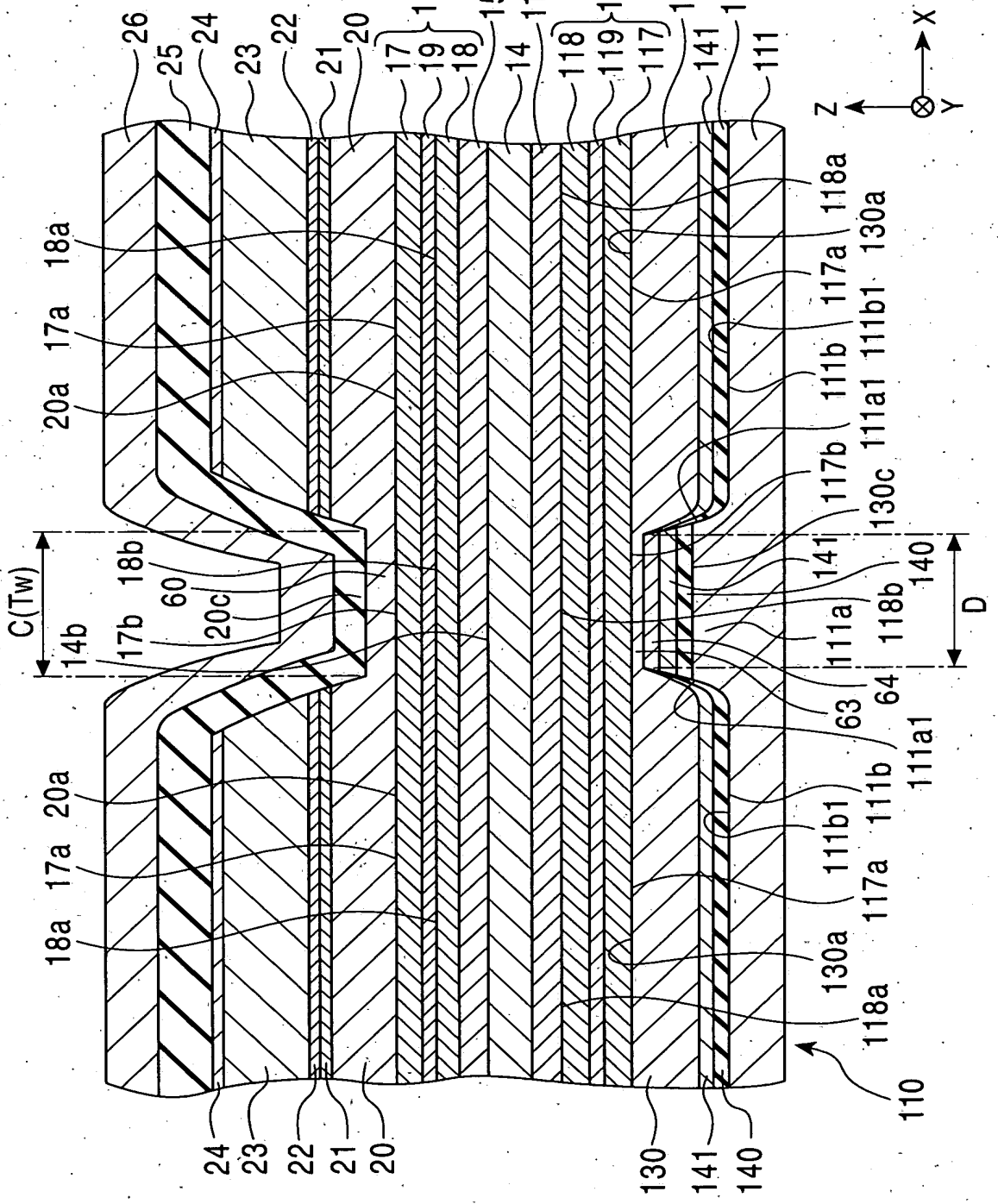
115
118
119
116
117
130
141
140
111
Z
X
Y
18a
17a
20a
18b
60
20c
17b
14b
C(Tw)
118a
130a
117a
111b1
111b
111a1
117b
130c
111a
141
140
118b
63
D
110

FIG. 9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16
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14
115
118
119
116
117
130
141
140
111
X
Z
Y
18a
17a
20a
C(Tw)
14b
17b
18b
60
20c
118a
130a
117a
111b1
111b
111a1
130c
141
140
D
111a
118b
64
63
110

FIG. 10

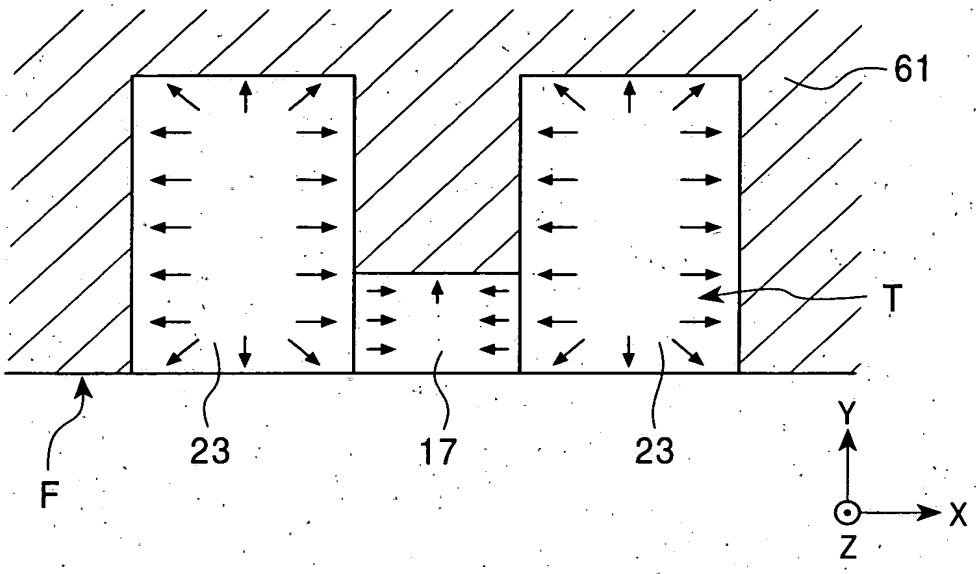


FIG. 11

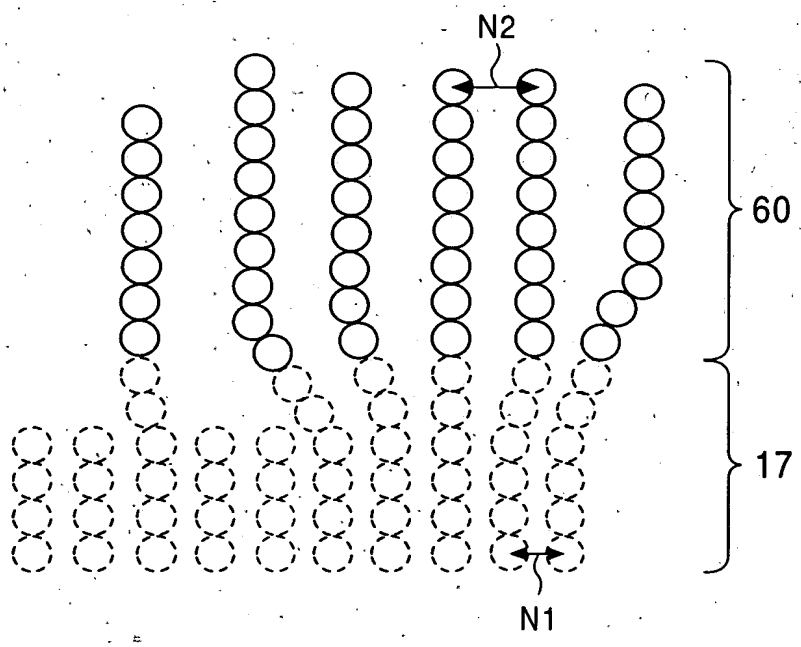


FIG. 12

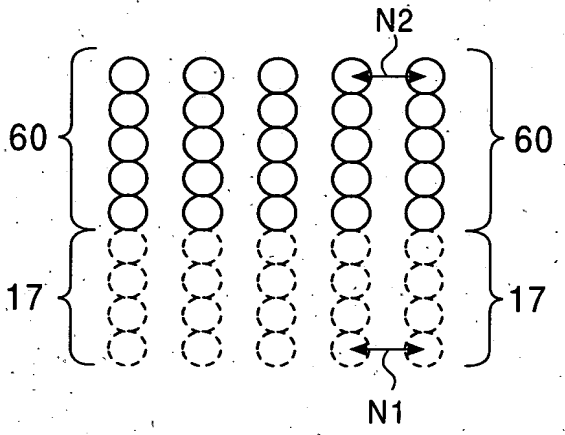


FIG. 13

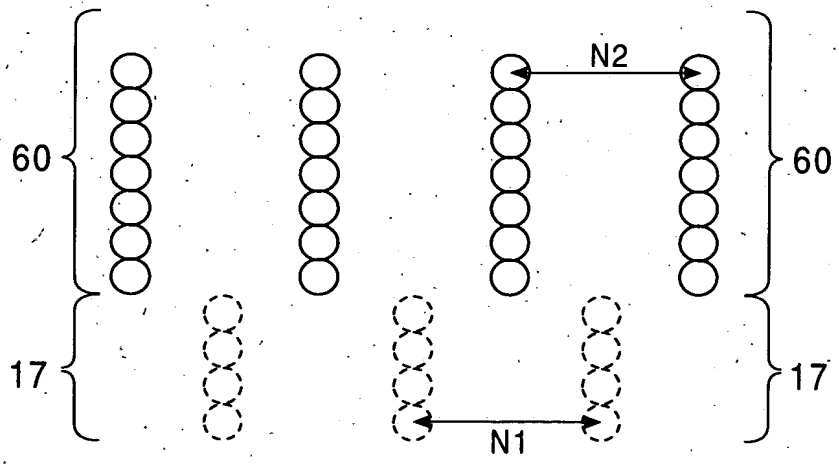


FIG. 14

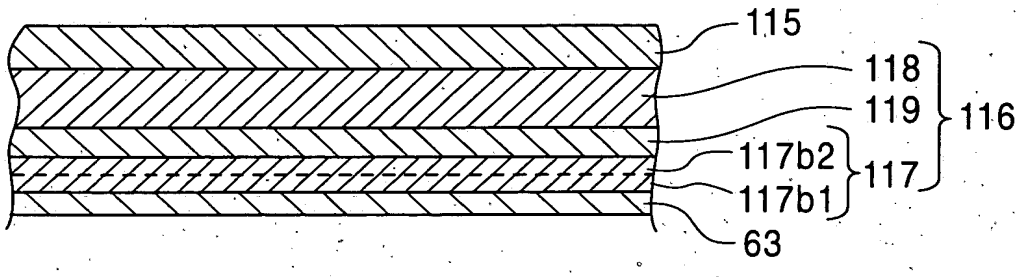


FIG. 15

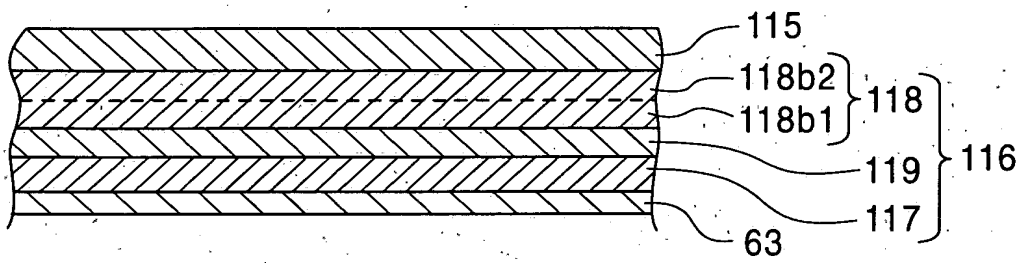


FIG. 16

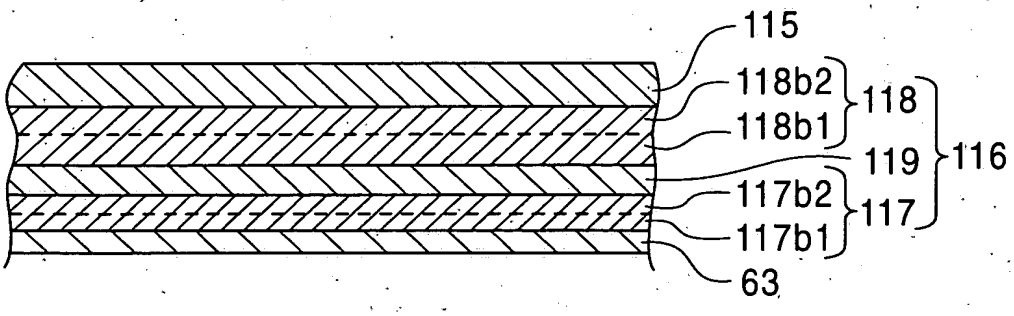


FIG. 17

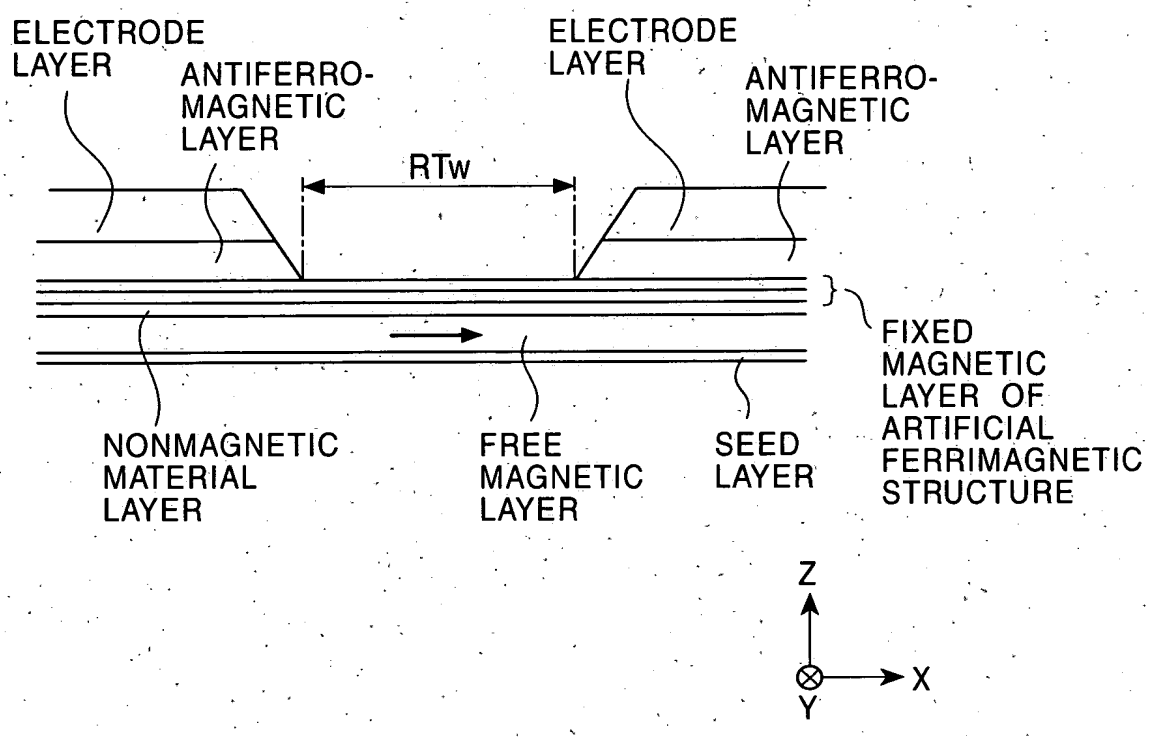

ELECTRODE LAYER
ANTIFERRO-MAGNETIC LAYER
RTw
ELECTRODE LAYER
ANTIFERRO-MAGNETIC LAYER
FIXED MAGNETIC LAYER OF ARTIFICIAL FERRIMAGNETIC STRUCTURE
NONMAGNETIC MATERIAL LAYER
FREE MAGNETIC LAYER
SEED LAYER
Z
X
Y

FIG. 18

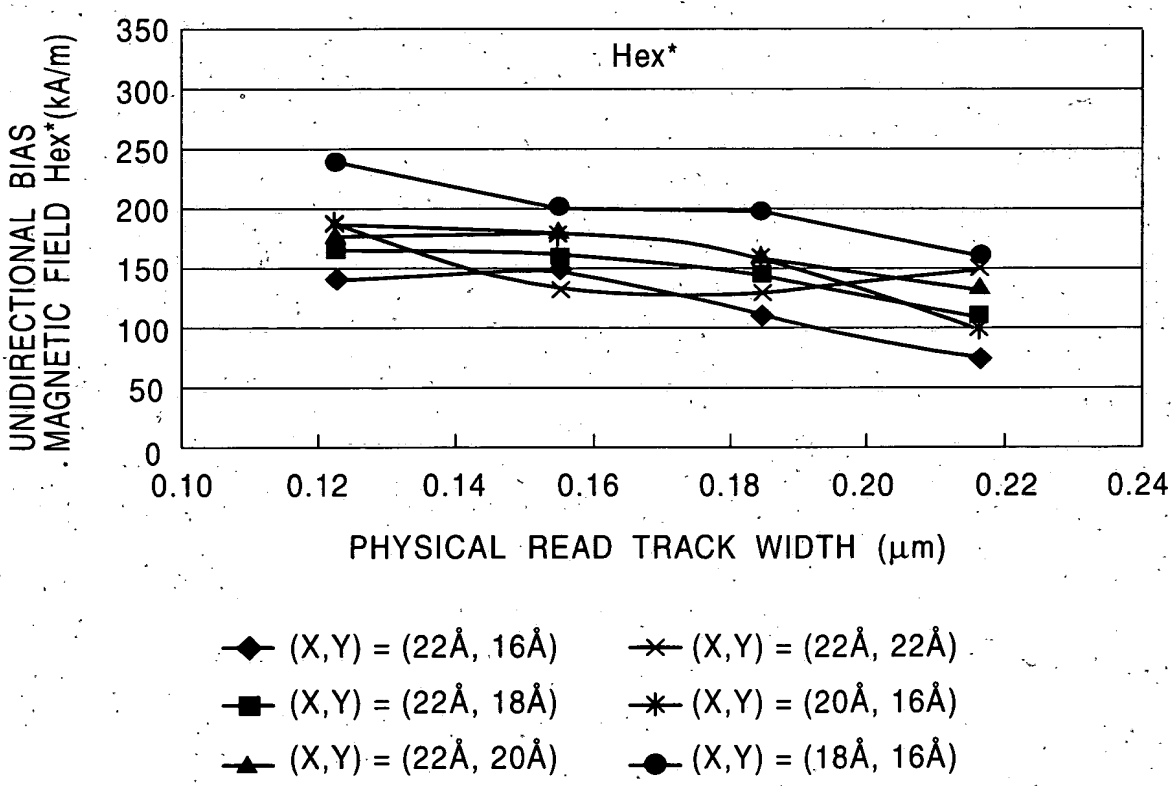

Hex*
UNIDIRECTIONAL BIAS MAGNETIC FIELD Hex*(kA/m)
350
300
250
200
150
100
50
0
0.10
0.12
0.14
0.16
0.18
0.20
0.22
0.24
PHYSICAL READ TRACK WIDTH (μm)
(X,Y) = (22Å, 16Å)
(X,Y) = (22Å, 22Å)
(X,Y) = (22Å, 18Å)
(X,Y) = (20Å, 16Å)
(X,Y) = (22Å, 20Å)
(X,Y) = (18Å, 16Å)

FIG. 19

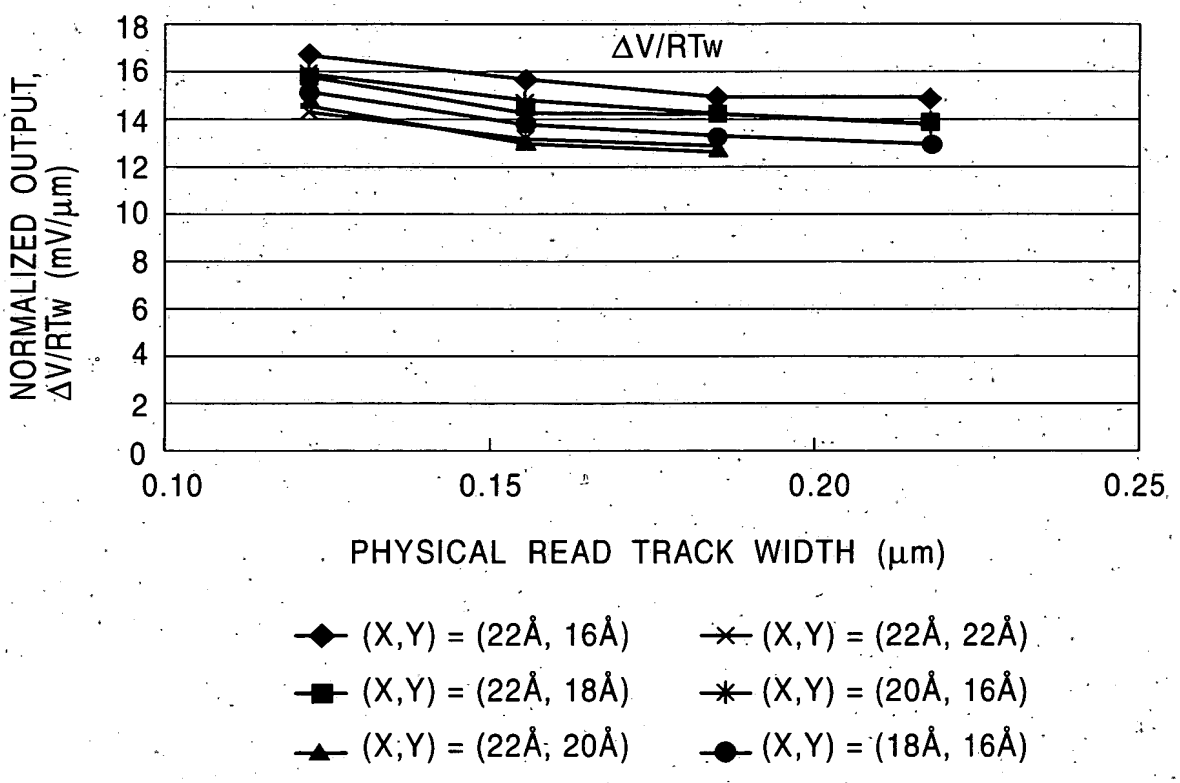

ΔV/RTw
NORMALIZED OUTPUT, ΔV/RTw (mV/μm)
18
16
14
12
10
8
6
4
2
0
0.10
0.15
0.20
0.25
PHYSICAL READ TRACK WIDTH (μm)
(X,Y) = (22Å, 16Å)
(X,Y) = (22Å, 18Å)
(X;Y) = (22Å; 20Å)
(X,Y) = (22Å, 22Å)
(X,Y) = (20Å, 16Å)
(X,Y) = (18Å, 16Å)

FIG. 20

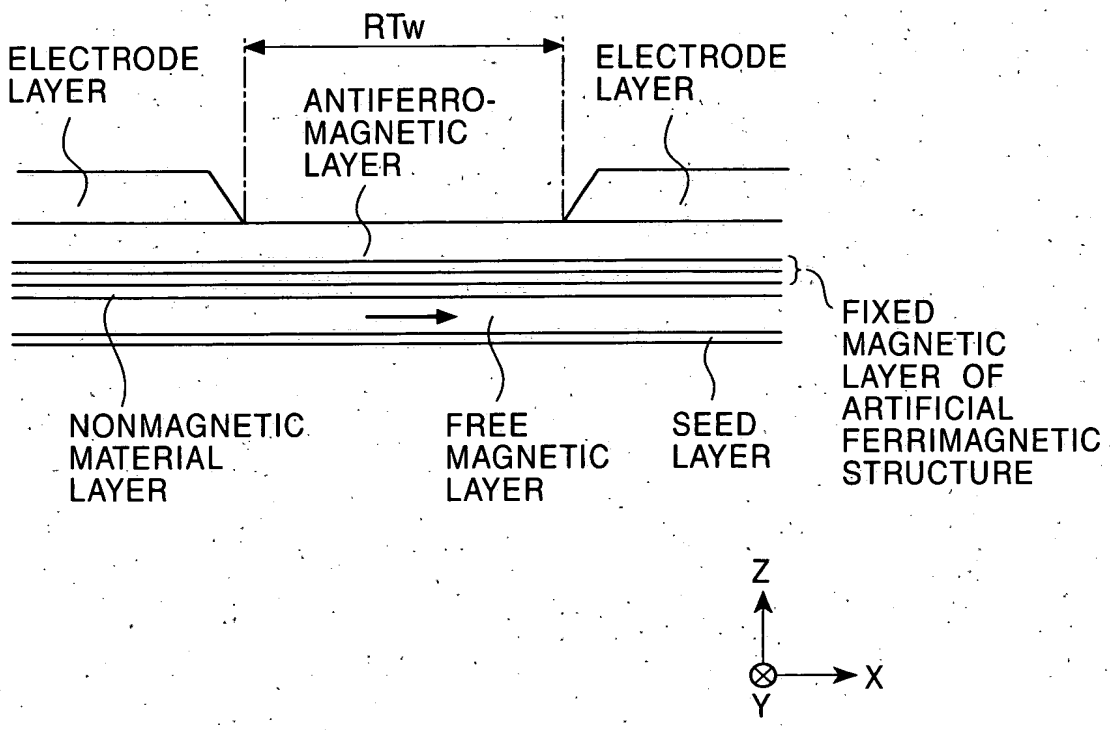

RTw
ELECTRODE LAYER
ANTIFERRO-MAGNETIC LAYER
ELECTRODE LAYER
FIXED MAGNETIC LAYER OF ARTIFICIAL FERRIMAGNETIC STRUCTURE
NONMAGNETIC MATERIAL LAYER
FREE MAGNETIC LAYER
SEED LAYER
Z
X
Y

FIG. 21

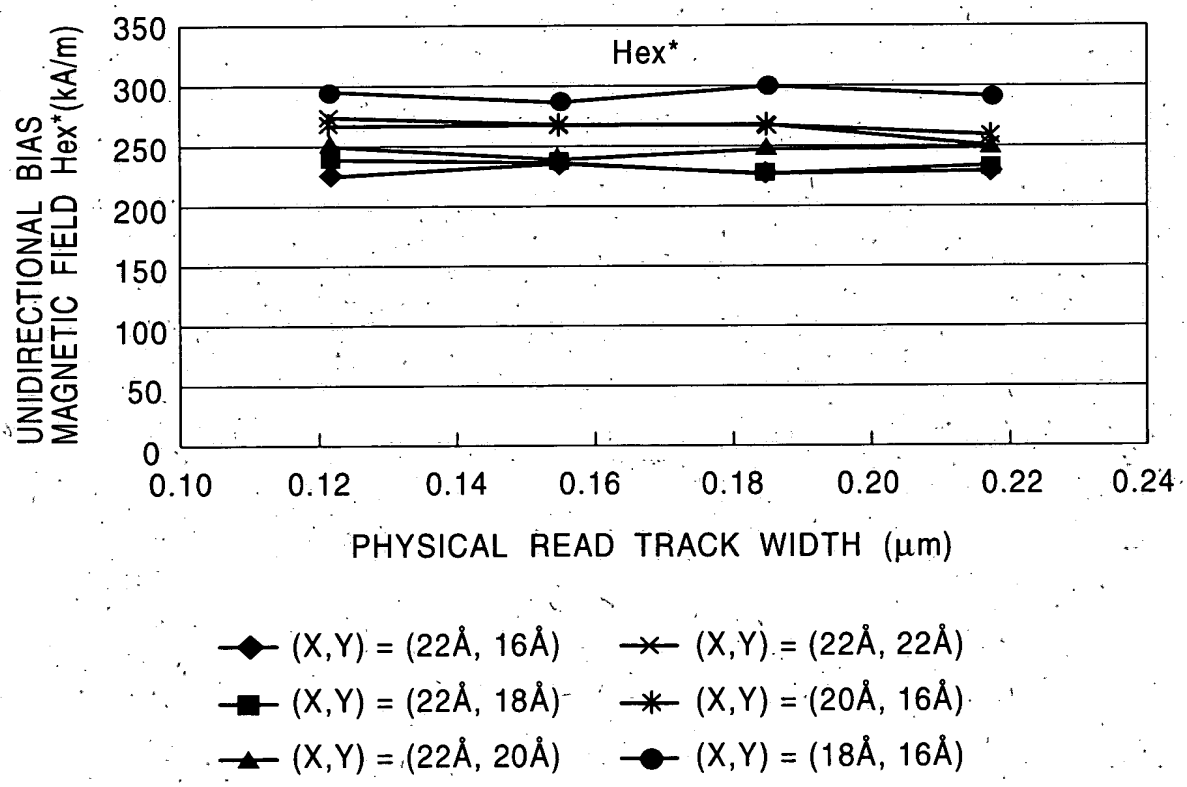

Hex*
UNIDIRECTIONAL BIAS MAGNETIC FIELD Hex*(kA/m)
350
300
250
200
150
100
50
0
0.10
0.12
0.14
0.16
0.18
0.20
0.22
0.24
PHYSICAL READ TRACK WIDTH (μm)
(X,Y) = (22Å, 16Å)
(X,Y) = (22Å, 18Å)
(X,Y) = (22Å, 20Å)
(X,Y) = (22Å, 22Å)
(X,Y) = (20Å, 16Å)
(X,Y) = (18Å, 16Å)

FIG. 22

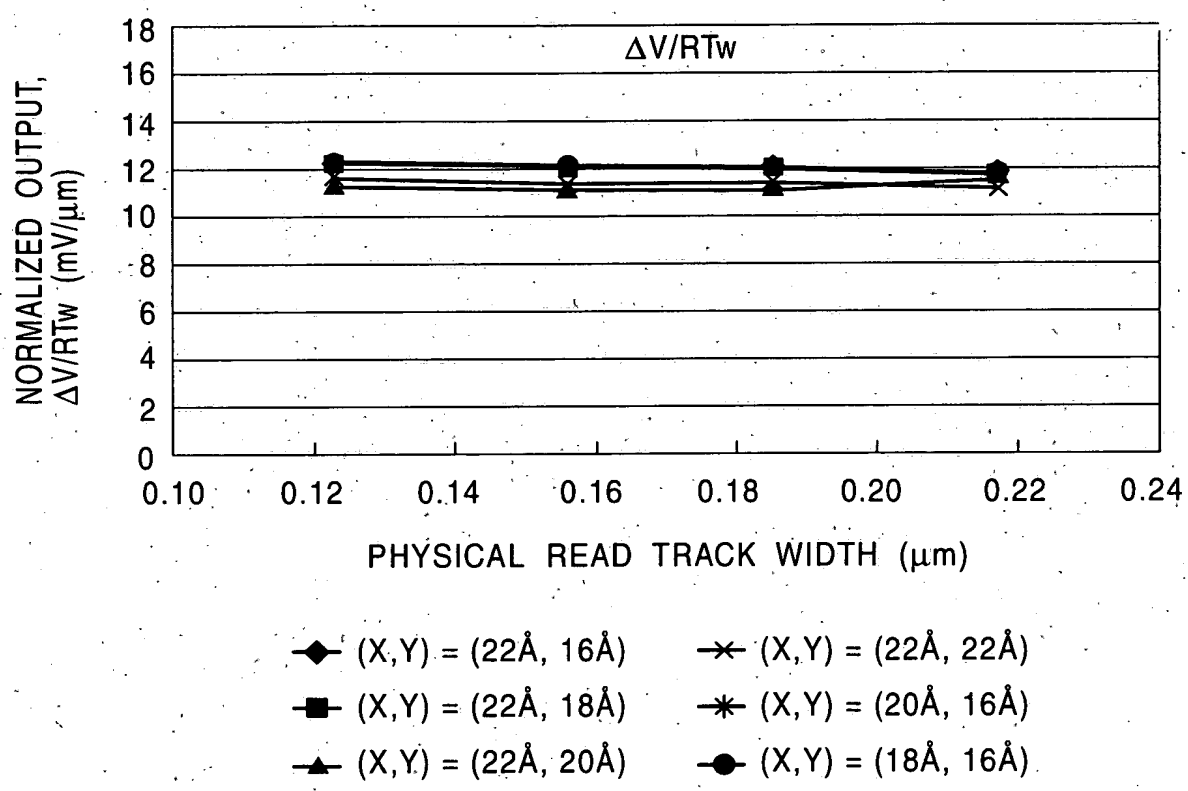

ΔV/RTw
NORMALIZED OUTPUT, ΔV/RTw (mV/μm)
18
16
14
12
10
8
6
4
2
0
0.10
0.12
0.14
0.16
0.18
0.20
0.22
0.24
PHYSICAL READ TRACK WIDTH (μm)
(X,Y) = (22Å, 16Å)
(X,Y) = (22Å, 18Å)
(X,Y) = (22Å, 20Å)
(X,Y) = (22Å, 22Å)
(X,Y) = (20Å, 16Å)
(X,Y) = (18Å, 16Å)

FIG. 23

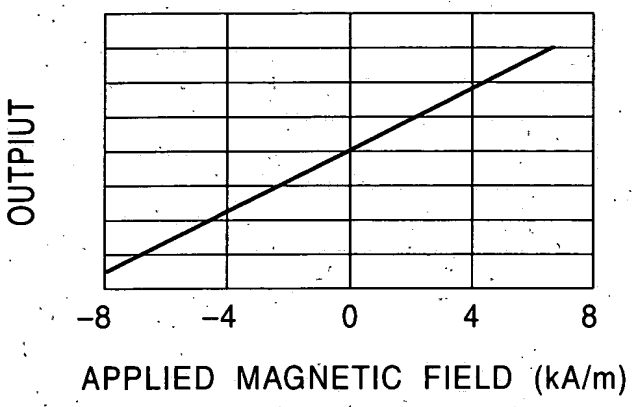

OUTPIUT
−8
−4
0
4
8
APPLIED MAGNETIC FIELD (kA/m)

FIG. 24

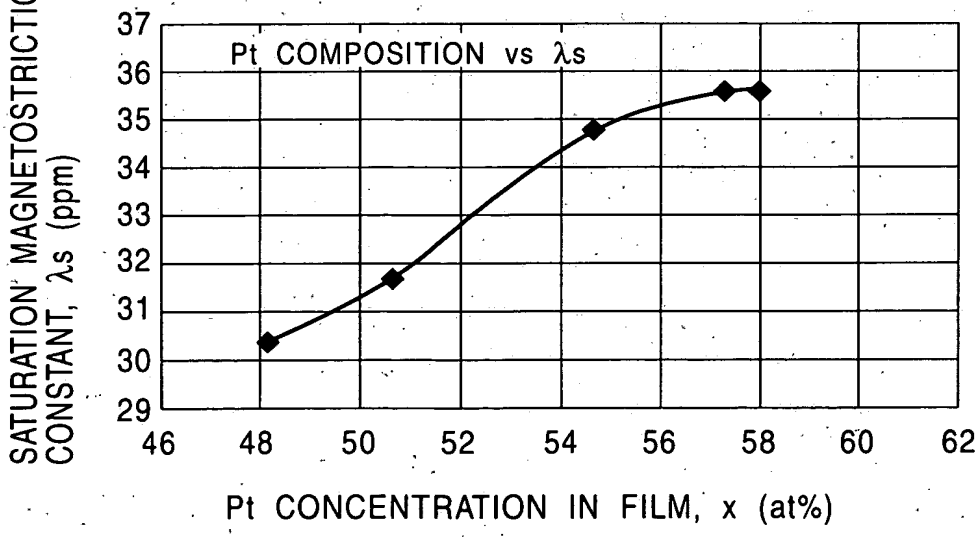

Pt COMPOSITION vs λs
SATURATION MAGNETOSTRICTION CONSTANT, λs (ppm)
37
36
35
34
33
32
31
30
29
46
48
50
52
54
56
58
60
62
Pt CONCENTRATION IN FILM, x (at%)

FIG. 25

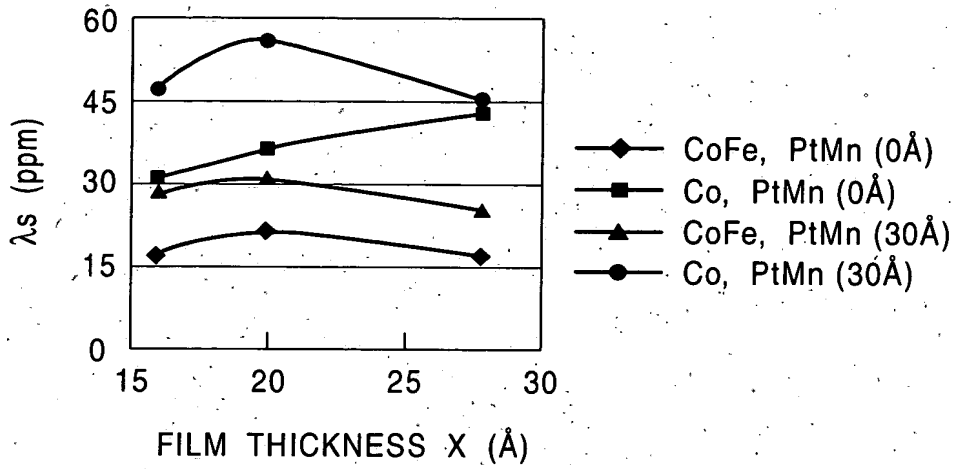
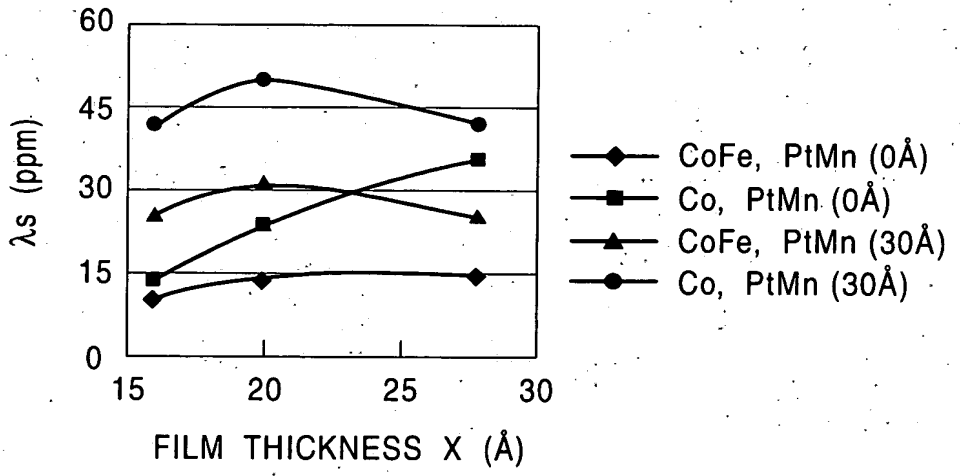

60
45
30
15
0
λs (ppm)
15
20
25
30
FILM THICKNESS X (Å)
CoFe, PtMn (0Å)
Co, PtMn (0Å)
CoFe, PtMn (30Å)
Co, PtMn (30Å)

FIG. 26


60
45
30
15
0
λs (ppm)
15
20
25
30
FILM THICKNESS X (Å)
CoFe, PtMn (0Å)
Co, PtMn (0Å)
CoFe, PtMn (30Å)
Co, PtMn (30Å)